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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,355	03/07/2005	Nobuhiro Nunoya	14321.67	4938

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WORKMAN NYDEGGER
(F/K/A WORKMAN NYDEGGER & SEELEY)
60 EAST SOUTH TEMPLE
1000 EAGLE GATE TOWER
SALT LAKE CITY, UT 84111

EXAMINER	
STAFFORD, PATRICK	
ART UNIT	**PAPER NUMBER**
2892	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	**Application No.**	**Applicant(s)**	
	10/527,355	NUNOYA ET AL.	
	Examiner	**Art Unit**	
	Patrick Stafford	2892	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/8/2006 and 5/5/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☒ Other: *2/28/2006 and 12/9/2005*.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. For the purposes of applying art, the claim is interpreted as being inclusive of the propagating region being different from the gain region.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-7, 9-10, 14-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Numai (U.S. Patent 6,501,776, hereafter '776). (Furuya U.S. Patent 4,464,762 is cited as evidence regarding claim 4.)

Claim 1 and 10: '776 teaches a semiconductor laser comprising:

a gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);

a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having an effective refractive index whose temperature dependence differs from that of the gain region and having no wavelength selectivity (col. 3, lines 3-15, active layer has

the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and

a reflecting region that reflects light propagated through the propagating region, and has no gain (col. 4, lines 17-28, the distributed Bragg reflector).

Claim 2: '776 teaches a semiconductor laser comprising:

a gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);

a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having a material with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity (col. 3, lines 3-15, active layer has the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and

a reflecting region that reflects light propagated through the propagating region, and has no gain (col. 4, lines 17-28, the distributed Bragg reflector).

Claim 3: '776 teaches a semiconductor laser comprising:

a gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);

a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having a structure with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity (col. 3, lines 3-15, active layer has the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and

a reflecting region that reflects light propagated through the propagating region, and has no gain (col. 4, lines 17-28, the distributed Bragg reflector).

Claim 4: ‘776 teaches the semiconductor laser as claimed in claim1, wherein the reflection region has a diffraction grating with a periodic structure (col. 4, lines 17-28, the distributed Bragg reflector). Distributed Bragg reflectors inherently have periodic structures (Furuya U.S. Patent 4,464,762, col. 1, lines 17-23).

Claim 5: ‘776 teaches a semiconductor laser comprising:

a first gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);

a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having a material with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity (col. 3, lines 3-15, active layer has the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and

a second gain region optically coupled to the propagating region, and having wavelength selectively (col. 6, lines 51-58 and col. 19, lines 20-29 and Fig. 12, parts 723).

Claim 6: ‘776 teaches a semiconductor laser comprising:

a first gain region having wavelength selectivity (col. 3, lines 24-28, the active layer);

a propagating region optically coupled to said gain region (col. 3, lines 27-28, the light guiding layer), having a structure with an effective refractive index whose temperature dependence differs from that of the gain region, and having no gain nor wavelength selectivity (col. 3, lines 3-15, active layer has the positive refractive-index temperature coefficient, the light guiding layer has the negative refractive-index temperature coefficient); and

a second gain region optically coupled to the propagating region, and having wavelength selectively (col. 6, lines 51-58 and col. 19, lines 20-29 and Fig. 12, parts 723).

Claim 7: '776 teaches the semiconductor laser of claim 3, as discussed above, wherein the structure of the propagating region differs from that of the gain region in terms of layer structure (col. 20, lines 19-24).

Claim 9: '776 teaches the semiconductor laser of claim 1, wherein the propagating region is composed of a material whose temperature differential coefficient of the effective refractive index (col. 20, lines 57-63) is different from that of a semiconductor (col. 9, lines 11-18).

Claim 10: '776 teaches the semiconductor laser of claim 1, as discussed above, wherein the propagating region is composed of a material whose temperature differential coefficient of the effective refractive index is negative (col. 3, lines 39-46).

Claim 14: '776 teaches the semiconductor laser of claim 1, wherein the gain region (Fig. 15A, part 1023), the propagating region (Fig. 15A, part 1024), and the reflection region (Fig. 15A, part 1025) are stacked (col. 21, line 66-col. 22, line 15).

Claim 15: '776 teaches the semiconductor laser of claim 1, wherein the gain region and the propagating region are coupled via optical path changing means (col. 7, lines 37-41).

Claim 16: '776 teaches the semiconductor laser of claim 1, wherein the propagating region (Fig. 14A part 924) has a waveguide structure having an optical confinement structure on the upper (Fig. 14A part 921, the cladding layer) and lower portions (col. 21, lines 37-39).

Claim 17: '776 teaches a semiconductor laser comprising:

a semiconductor substrate (col. 21, lines 64-65 and Fig. 15A, part 1041);

an active layer formed on the semiconductor substrate, and having a distributed reflection structure (col. 22, lines 3-4 and Fig. 15A, part 1023);

a cladding layer formed on said active layer (col. 22, lines 11-12 and Fig. 15A, part 1026)

a temperature compensation layer stacked on the active layer (col. 22, lines 3-16 and Fig. 15A part 1032) and having an effective refractive index whose temperature dependence differs from that of the active layer (col. 22, lines 3-24).

Product claims are limited to the claimed structure, not the method of forming the structure. The recitation of a "removed region" is not directed to the structure of the device.

Claim 18: '776 teaches a semiconductor laser comprising:

a semiconductor substrate (col. 11, lines 48-57 and Fig. 1A, part 41);

a distributed Bragg reflection layer stacked on the semiconductor substrate (col. 4, 16-29 and col. 11, lines 48-57 and Fig. 1A, part 25);

an active layer formed on the semiconductor substrate, and having a distributed reflection structure (col. 11, lines 48-57 and Fig. 1A, part 23);

a temperature compensation layer stacked on the active layer (col. 11, lines 48-57 and Fig. 1A part 31) and having an effective refractive index whose temperature dependence differs from that of the active layer (col. 12, lines 7-13);

a reflection layer stacked on the temperature compensation layer (col. 11, lines 48-63 and Fig. 1A and part 22).

Claim 19: '776 teaches the semiconductor laser of claim 17 as discussed above.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Numai '776 in view of Kirkby (U.S. Patent 4,583,227, hereafter '227).

'776 teaches the semiconductor laser of claim 1, as discussed above. '776 does not teach the absolute value of a product of a length of the propagating region and a difference between a temperature differential coefficient of the effective refractive index of the gain region and a temperature differential coefficient of the effective refractive index of the propagating region is equal to or greater than $7.5x10^{-4}$ μm/K. Kirkby '227 teaches the absolute value of a product of a length of the propagating region and a difference between a temperature differential coefficient of the effective refractive index of the gain region and a temperature differential coefficient of the effective refractive index of the propagating region is equal to or greater than $7.5x10^{-4}$ μm/K is a suitable value for temperature compensating semiconductor lasers (col. 7, lines 4-8). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.,* 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the absolute value of a product of a length of the propagating region and a difference between a temperature differential coefficient of the effective refractive index of the gain region and a temperature differential coefficient of the effective refractive index of the propagating region is equal to or greater than $7.5x10^{-4}$ μm/K.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Numai '776 in view of Funabashi et al (U.S. Patent 6,580,740, hereafter '740).

Claim 11: '776 teaches the semiconductor laser of claim 1, as discussed above. '776 does not explicitly teach the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index. Funabashi '740 teaches the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index is suitable for the grating in a semiconductor laser with an active layer (col. 1, lines 26-41). The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the gain region comprising a diffraction grating formed by a periodic perturbation with at least one of real and imaginary parts of a complex refractive index.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Numai '776 in view of Funabashi '740, as applied to claim 11 above, and further in view of Kashyap (U.S. Patent 5,719,974, hereafter '794).

'776 and '740 teach the semiconductor laser of claim 11, as discussed above. They do not explicitly teach the length of the propagating region is determined such that a longitudinal mode spacing determined by a sum of an effective length of the diffraction grating and a length of the propagating region, is greater than a stop bandwidth of the diffraction grating. '794 teaches the length of the propagating region is determined such that a longitudinal mode spacing determined by a sum of an effective length of the diffraction grating and a length of the

propagating region, is greater than a stop bandwidth of the diffraction grating (col. 8, line 24 and col. 9, lines 2-5) as suitable values for the diffraction grating in a semiconductor laser. The selection of something based on its known suitability for its intended use has been held to support a *prima facie* case of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.,* 325 U.S. 327, 65 USPQ 297 (1945). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the length of the propagating region such that a longitudinal mode spacing determined by a sum of an effective length of the diffraction grating and a length of the propagating region, is greater than a stop bandwidth of the diffraction grating.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Numai '776 in view of Funabashi '740, as applied to claim 11 above, and further in view of Ikeda et al (U.S. Patent 5,155,737, hereafter '737).

'776 and '740 teach the semiconductor laser of claim 11, as discussed above. They do not explicitly teach the coupling coefficient of the diffraction grating of the gain region being greater than 300 cm^{-1}. Ikeda '737 teaches a diffraction grating with a very high coupling coefficient, greater than 300 cm^{-1} as suitable for semiconductor lasers. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a diffraction grating with a very high coupling coefficient, greater than 300 cm^{-1}. The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the

reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick Stafford whose telephone number is (571) 270-1275. The examiner can normally be reached on M-Th 7:30-5 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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MICHAEL B. CLEVELAND
SUPERVISORY PATENT EXAMINER